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TURCK

PS SERIES
PRESSURE SENSORS

IO-Link Parameters

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1 About these Instructions

These instructions describe the parameterization of the pressure sensor series PS with IO-Link. It contains the operation via IO-Link, information about IO-Link functions. and a list of all required IO-Link parameters.

1.1 Target groups

These instructions are aimed at qualified personnel and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols

DANGER
DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.

WARNING
WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.

CAUTION
CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.

NOTICE
NOTICE indicates a situation which may lead to property damage if not avoided.

NOTE
NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.

➤ **CALL TO ACTION**
This symbol denotes actions that the user must carry out.

➥ **ACTION RESULT**
This symbol denotes relevant results of actions.

1.3 Additional documents

Besides this document, the following material can be found on the Internet at www.turck.com:
- Data sheet
- Quick start guide
- Operating instructions
- IO-Link Devices – User Manual Commissioning
- Turck Software Manager (TSM) for download of IODDs, GSDML files, DTMs and more

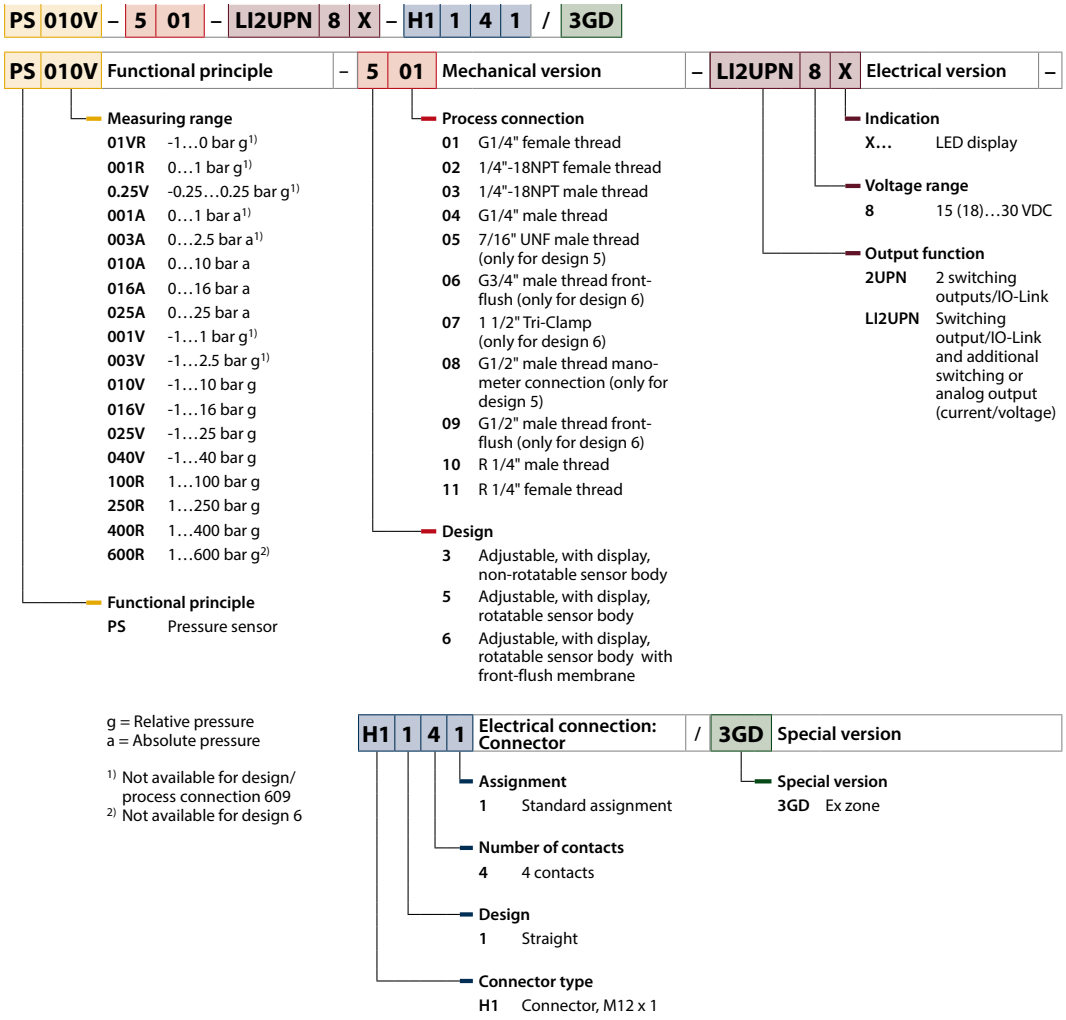
1.4 Feedback on these instructions

We are committed to always keeping these instructions as informative and as clear as possible. Should you have any suggestions for a better design or any information is missing from the instructions, please send your suggestions to techdoc@turck.com.

2 Notes on the Product

2.1 Product identification

These instructions apply to the pressure sensors of the PS-Series.



2.2 Manufacturer and service

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr
Germany

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats. You can access the product database at the following address: http://www.turck.de/products/
Should you have any further questions, please contact the sales and service team in Germany on the following telephone numbers:
Sales: +49 208 4952-380
Technology: +49 208 4952-390

Outside Germany, please contact your Turck representative.

3 Software-Supported IO-Link-Parameterization

NOTE
Locking of the pushbutton guided menu
During the time the data processing device communicates via IO-Link, the pushbutton-guided menu is locked; this means, the parameters can no longer be changed via the pushbuttons. However, the process values can be accessed via the pushbuttons.

The ports of the IO-Link-master can be configured in the IO-Link-mode (IOL) or in the standard-IO-mode.
If a port is configured in the SIO-Mode, the IO-Link-Master on this port behaves like a normal digital input and the connected IO-Link device sends the standard switching output to the IO-Link-master – there is no communication between the device and the master.

If the port is configured in the IOL-mode, the IO-Link-master tries to "wake" the connected IO-Link-device via the"Wake-up Request". If the master receives a response from the signal processor, both devices start to communicate with each other. First, the communication parameters are exchanged; then the cyclic data exchange of the process data (objects) starts.

In case of active IO-Link-communication (IOL-mode), both cyclic and acyclic communication services are available.

Parameterization via IO-Link can occur in different ways:
- via on-request data objects (e. g., IO-Link-function block close to the control),
- via tool-based engineering via FDT/DTM (e.g., PACTware™ with the use of DTM or the IODD)

Device parameters (On-Request Data Objects)

Device parameters are exchanged in an acyclical manner and upon the request of the IO-Link-Master. The IO-Link-Master always sends a request to the device first, then the device responds. This is the case when the data is written into the device and read from the device. With the help of the On-Request Data Objects (ORDO), the parameters can be written into the device (Write) or the device status can be read from the device (Read).

4 IO-Link Parameters

4.1 General parameters

The general parameter data is used to identify the sensors. This data can only be read.

Address (hexa-decimal)	Parameter name	Description	Value (hexa-decimal)	Meaning
04	IO-Link revision ID	Imported IO-Link version		
07	Vendor ID 1	Vendor ID	01	317 for Hans Turck GmbH & Co. KG IM/Vendor_ID_Table.xml
08	Vendor ID 2		3D	
09	Device ID 1	Device ID (assigned by the manufacturer)	01	
0A	Device ID 2		see table below	
0B	Device ID 3		see table below	

Device ID 2

Electrical output	Device ID 2 (hexadecimal)
2UPN:	00
LI2UPN:	01
LUUPN:	02

Device ID 3

Measuring range	Device ID 3 (hexadecimal)
01VR:	0x00
001A:	0x01
003A:	0x02
010A:	0x03
016A:	0x04
025A:	0x05
001V:	0x06
003V:	0x07
010V:	0x08
016V:	0x09
025V:	0x0A
040V:	0x0B
001R:	0x0C
100R:	0x0D
250R:	0x0E
400R:	0x0F
600R:	0x10
0.25V:	0x12

4.2 Process data

4.2.1 Representation

The measured value as well as the switching states of the 2 sensor outputs are mapped in the process data. The process data width is 16 bit. Formatting is implemented in compliance with the general representation of process values.

Measured value				Switching state A2	Switching state A1
Bit 15	…	Bit 3	Bit 2	Bit 1	Bit 0

4.2.2 Value range

The measured value range is mapped via 14 bits (Bit 2…15).

Value (hexadecimal)	Example 0…10 bar (decimal)	Pressure sensor	Function
0x3FFF	16383	> 10.5 bar	Overflow
0x3FFE	16382	–	Not defined
:	:		
0x3DB3	15795		
0x3DB2	15794	10…10.5 bar	5 % overflow tolerance
:	:		
0x3BB0	15104		
0x3AFF	15103	0…10 bar	Measuring range
0x3AFE	15102		
:			
0x0501	1281		
0x0500	1280		
0x04FF	1279	-0,5…0 bar	5 % underflow tolerance
:	:		
0x024D	589		
0x024C	588	–	Not defined
:	:		
0x0001	1		
0x0000	0	< -0.5 bar	Underflow

4.2.3 Calculation of the pressure value

If the process value IOL is given for a -1…10 bar sensor, the pressure is calculated in bar as follows:

$$\text{Pressure} = \left((\text{IOL value} - 1280) \times \frac{11\ \text{bar}}{15103 - 1280} \right) - 1\ \text{bar}$$

4.3 General service PDU

The sensors of the PS series support data traffic via so-called SPDUs. The data is only transferred when required and on a special data channel. The SPDU transfer also makes it possible to set the parameters and configuration of the sensors.

Index (hexa-decimal)	Parameters Name	Access R: Read W: Write	Length in bytes	Data type	Description
0x00	Direct page 1	R	16	Record of 16 Unsigned8	
0x10	Vendor name	R	32	String	Vendor name, e.g. “Hans Turck GmbH & Co.”
0x11	Vendor text	R	32	String	Vendor description, e.g. “http://www.turck.com”
0x12	Product name	R	32	String	Product name , e.g. “PS400R-LI2UPNIOL8X”
0x13	Product id	R	16	String	Turck product ID number, e.g. “6845641”
0x14	Product text	R	32	String	Product description, e.g. “pressure sensor with 2 switches”
0x15	Serial number	R	16	String	Batch code and serial number, e.g. 123456-18
0x17	Firmware revision	R	16	String	Firmware version, e.g. 3.0.0.0
0x18	Application specific name	RW	16	String	Measuring point, e.g. “measuring point 39”
0x28	Process data in	R	2	Unsigned16	Process data (see page 8)

4.4 Specific service PDU – Overview

Index (hexa-decimal)	Parameters Name	Access R: Read W: Write	Byte Length	Data type	Description	Default value	See page
0x51	Ou1	RW	1	Unsigned8	Function of output 1	0x00	11
0x52	Ou2	RW	1	Unsigned8	Function of output 2 Li2UPN LUUPN 2UPN	0x04 0x08 0X00	11 12
0x53	P-n	RW	1	Unsigned8	Behavior switching output	0X00	12
0x54	Uni	RW	1	Unsigned8	Display unit	0x00	12
0x55	diS	RW	1	Unsigned8	Display setting	0x00	13
0x58	Menu locked	RW	1	Unsigned8	Locking the menu	0x00	13
0x59	IO-Link write protection	RW	1	Unsigned8	IO-Link parameter with write protection	0x00	13
0x60	Sp1/rP1 (FH1/FL1)	RW	4	Record of 2 Unsigned16	Switch/reset point 1	SP: 0x2000 rP: 0x1000	13 13
0x61	Sp2/rP2 (FH2/FL2)	RW	4	Record of 2 Unsigned16	Switch/reset point 2 (not for LUUPN)	SP: 0x2000 rP: 0x1000	13
0x62	ASP/AEP	RW	4	Record of 2 Unsigned16	Start value/end value of the analog range (not for 2UPN)	ASP see below AEP:0x3AFF	14
0x68	cof	RW	2	Signed16	Offset adjustment	0x0000	14
0x69	HI	R	2	Unsigned16	Stored max. value	–	14
0x6A	LO	R	2	Unsigned16	Stored min. value	–	14
0x70	dAA	RW	2	Unsigned16	Damping of the analog output	0x0000	14
0x71	dAP	RW	2	Unsigned16	Damping of switching output/ switching outputs	0x0000	15
0x78	dsp1	RW	2	Unsigned16	Switching delay of switch point of output 1	0x0000	15
0x79	drp1	RW	2	Unsigned16	Switching delay of reset switch point of output 1	0x0000	15
0x7A	dsp2	RW	2	Unsigned16	Switching delay of switch point of output 2 (not for LUUPN)	0x0000	15
0x7B	drp2	RW	2	Unsigned16	Switching delay of reset switch point of output 2 (not for LUUPN)	0x0000	15

Index 0x62: Default values for ASP (Start value of the analog range)

Type	Measuring range	Default value
PS01VR	-1…0 bar	0x0500
PS0.25V	-0.25…+0.25 bar	0x2000
PS001R	0…+1 bar	0x0500
PS001V	-1…+1 bar	0x2000
PS003V	-1…+2.5 bar	0x146D
PS010V	-1…+10 bar	0x09E9
PS016V	-1…+16 bar	0x082D
PS025V	-1…+25 bar	0x0714

Type	Measuring range	Default value
PS040V	-1…+40 bar	0x0651
PS100R	0…+100 bar	0x0500
PS250R	0…+250 bar	0x0500
PS400R	0…+400 bar	0x0500
PS600R	0…+600 bar	0x0500
PS001A	0…+1 bar	0x0500
PS003A	0…+2.5 bar	0x0500
PS010A	0…+10 bar	0x0500
PS016A	0…+16 bar	0x0500
PS025A	0…+25 bar	0x0500

4.5 Specific service PDU

Index 0x51: Function of output 1

Value (hexadecimal)	Menu item	Function
0x00	Hno	Hysteresis function N/O = NO contact
0x01	Hnc	Hysteresis function N/C = NC contact
0x02	Fno	Window function N/O = NO contact
0x03	Fnc	Window function N/C = NC contact

Index 0x52: Function of output 2

Value (hexadecimal)	Menu item	Function
0x00	Hno	Hysteresis function N/O = NO contact
0x01	Hnc	Hysteresis function N/C = NC contact
0x02	Fno	Window function N/O = NO contact
0x03	Fnc	Window function N/C = NC contact

For LI2UPN:

Value (hexadecimal)	Menu item	Function
0x00	Hno	Hysteresis function N/O = NO contact
0x01	Hnc	Hysteresis function N/C = NC contact
0x02	Fno	Window function N/O = NO contact
0x03	Fnc	Window function N/C = NC contact
0x04	4 - 20	4…20 mA linear increase
0x05	0 - 20	0…20 mA linear increase
0x06	20 - 4	20…4 mA linear decrease
0x07	20 - 0	20…0 mA linear decrease
0x08	0 - 10	0…10 V linear increase
0x09	0 - 5	0…5 V linear increase
0x0A	1 - 6	1…6 V linear increase
0x0B	10 - 0	10…0 V linear decrease
0x0C	5 - 0	5…0 V linear decrease
0x0D	6 - 1	6…1 V linear decrease

For LUUPN:

Value (hexadecimal)	Menu item	Function
0x08	0-10	0…10 V linear increase
0x09	0- 5	0…5 V linear increase
0x0A	1- 6	1…6 V linear increase
0x0B	10-0	10…0 V linear decrease
0x0C	5 -0	5…0 V linear decrease
0x0D	6 -1	6…1 V linear decrease

Index 0x53: Behavior of the switching outputs

Value (hexadecimal)	Menu item	Function
0x00	PnP	p switching
0x01	nPn	n switching

Index 0x54: Unit shown in the display

Value (hexadecimal)	Menu item	Function
0x00	bAr	bar
0x01	PSi	psi
0x02	kPA	kPa
0x03	MPA	MPa
0x04	Ud 1	Millibar = Hectopascal
0x05	Ud 2	mm Hg (0 °C) = Torr
0x06	Ud 3	Inch of water (60 °F)
0x07	Ud 4	Inch of water (39 °F)
0x08	Ud 5	Foot of water (39 °F)
0x09	Ud 6	Inch of Hg (60 °F)
0x0A	Ud 7	Inch of Hg (32 °F)
0x0B	Ud 8	mH_2O (16 °C)
0x0C	Ud 9	mH_2O (4 °C)
0x0D	Ud10	kg / cm^2

For pressure sensors, only displayable units are shown on the display. These depend on the end value of the measuring range. The following table shows the supported measuring units:

Measuring range end	bar	psi	kPa	Mpa	Ud1	Ud2	Ud3	Ud4	Ud5	Ud6	Ud7	Ud8	Ud9	Ud10
1 bar	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3 bar	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10 bar	+	+	+	+	–	+	+	+	+	+	+	+	+	+
16 bar	+	+	+	+	–	–	+	+	+	+	+	+	+	+
25 bar	+	+	+	+	–	–	–	–	+	+	+	+	+	+
40 bar	+	+	+	+	–	–	–	–	+	+	+	+	+	+
100 bar	+	+	–	+	–	–	–	–	+	+	+	+	+	+
250 bar	+	+	–	+	–	–	–	–	+	+	+	+	+	+
400 bar	+	+	–	+	–	–	–	–	–	–	–	+	+	+
600 bar	+	+	–	+	–	–	–	–	–	–	–	+	+	+

Index 0x55: Measured value update time/rotating/disabling a display

Value (hexadecimal)	Menu item	Function
0x00	50	50 ms measured value update time
0x01	200	200 ms measured value update time
0x02	600	600 ms measured value update time
0x03	r50	50 ms measured value update time/display rotated 180°
0x04	r200	200 ms measured value update time/display rotated 180°
0x05	r600	600 ms measured value update time/display rotated 180°
0x06	Off	Display disabled

Index 0x58: Menu locked

Value (hexadecimal)	Function
0x00	Menu unlocked
0x01	Parameters can be displayed but not changed (not even in SIO mode)
0x02	Menu generally locked

Index 0x59: IO-Link write protection

Value (hexadecimal)	Function
0x00	No write protection
0x01	Writing of parameters via IO-Link not possible (except 0x59)

Index 0x60: Switch and reset point 1

Switch point (SP) and related reset point (rP) are transferred together as one record in process value format. Transfer is executed according to the "big endian" specification.

Switch point		Reset point	
MSB	LSB	MSB	LSB
0			1

The following values are allowed:
The switch point must be at least 0.5 % f.s. above the reset point:
SP - rP > 0x45
The reset point must be at least 0.5 % f.s. above the start value of the measuring range:
rP > 0x545
The switch point should not exceed the end value of the measuring range:
SP ≤ 0x3AFF

Index 0x61: Switch and reset point 2

See index 60: Switch and reset point 1

Index 0x62: Start and end value of the analog range
Transfer is executed according to the "big endian" specification.

Analog range start		Analog range end	
MSB	LSB	MSB	LSB

The following values are allowed:
The end value must be at least 10 % f.s. above the start value:
AEP - ASP > 0x566
The start value of the analog range should not drop below the start value of the measuring range:
ASP ≥ 0x0500
The end value of the analog range should not exceed the end value of the measuring range:
AEP ≤ 0x3AFF

Index 0x68: Offset
Transfer is executed according to the "big endian" specification.

Offset value	
MSB	LSB

The following values are allowed:
The offset (COF) can be ± 10 % of the measuring range. It is transferred with a sign bit.
-0x526 < COF < 0x526

Index 0x69: Maximum value memory
Formatting is implemented in compliance with the general representation of process values (see above).

Index 0x6A: Minimum value memory
Formatting is implemented in compliance with the general representation of process values (see above).

Index 0x70: Damping of the analog output
Transfer is executed according to the "big endian" specification.

Damping value	
MSB	LSB

Value (hexadecimal)	Function
0x0000	0.00 s
0x0001	0.01 s
0x0002	0.02 s
…	…
0x018F	3.99 s
0x0190	4.00 s

Index 0x71: Damping of the switching output
see Index 0x70: Damping of the analog output

Index 0x78: Switching delay of switch point of output 1
Transfer is executed according to the "big endian" specification.

Damping value	
MSB	LSB
0	1

Value (hexadecimal)	Function
0x0000	0.0 s
0x0001	0.1 s
0x0002	0.2 s
…	…
0x01F3	49.9 s
0x01F4	50.0 s

Index 0x79: Switching delay of reset point of output 1
see Index 0x78: Switching delay of switch point of output 1

Index 0x7A: Switching delay of switch point of output 2
see Index 0x78: Switching delay of switch point of output 1

Index 0x7B: Switching delay of reset point of output 2
see Index 0x78: Switching delay of switch point of output 1

4.6 Error types

Code	Additional code	Name	Description
128 (0x80)	0 (0x00)	Device application error - no details	Service has been refused by the device application and no detailed information of the incident is available
128 (0x80)	17 (0x11)	Index not available	Access occurs to a not existing index
128 (0x80)	18 (0x12)	Subindex not available	Access occurs to a not existing subindex
128 (0x80)	35 (0x23)	Access denied	Write access on a read-only parameter
128 (0x80)	48 (0x30)	Parameter value out of range	Written parameter value is outside its permitted value range
128 (0x80)	51 (0x33)	Parameter length overrun	Written parameter length is above its predefined length
128 (0x80)	52 (0x34)	Parameter length underrun	Written parameter length is below its predefined length
128 (0x80)	53 (0x35)	Function not available	Written command is not supported by the device application
128 (0x80)	54 (0x36)	Function temporarily unavailable	Written command is not available due to the current state of the device application
128 (0x80)	64 (0x40)	Invalid parameter set	Written single parameter collides with other actual parameter settings
128 (0x80)	65 (0x41)	Inconsistent parameter set	Parameter inconsistencies were found at the end of block parameter transfer, device plausibility check failed
129 (0x81)	255 (0xff)	EEPROM FAILURE	The EEPROM failed, stable operation is not possible anymore. Replace the device!

4.7 Events

Code	Type	Name	Description
30480 (0x7710)	Error	Short circuit	Check installation
36001 (0x8ca1)	Error	Overload	
36002 (0x8ca2)	Error	Underload	
36003 (0x8ca3)	Warning	Overrun	
36004 (0x8ca4)	Warning	Underrun	
36006 (0x8ca6)	Notification	New maximum value recorded	
36007 (0x8ca7)	Notification	New minimum value recorded	
36009 (0x8ca9)	Error	Test Event	
36010 (0x8caa)	Error	Critical Error	The sensor encountered a critical error and needs to be replaced.

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